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PROGRESS REPORT

Period of April 1 to April 30, 1964

Contract No. AF33(600)40280

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A F-101 FLIGHT TEST

Random striping was present on the primary film on the three flights flown this month, 104 through 106. Figure 1 is an enlargement of the 106 primary film showing a typical example of the video striping.

Correlated film does not show the striping as a change in video level, but rather as reduced signal-noise ratio. Airport runways, highways and city street patterns were resolved on the flights. Single rows of cars were clearly differentiated from the double rows in the Pentagon parking lot.

In an effort to isolate the cause of the video level change, the system instrumentation was modified to record the receiver TWT grid 3 voltage, the TR tube keep-alive voltage, and the output of the "radar power monitor". Post-flight evaluation of the magnetic tape recording indicated no fluctuations of these functions. Other instrumentation changes involved monitoring the Recorder blanking waveform to determine if a phase reversal caused the difficulty.

No system failures were encountered this month. Doppler Frequency Tracker operation was good on all three flights. The latest Recorder received from Itek, 007, was flown with satisfactory operation. Transmitter 002 was used on flight 106, in preparation for delivery. The video striping problem remains with further tests planned to isolate the cause.

B PHASE II FLIGHT TEST

The first radar system has been operated in the laboratory at the testing site. Tests are continuing on the equipment and modifications are made to maintain this system in the same configuration as the second system, now in F-101 test.

The high voltage power supply in Recorder 005 was replaced because of oil leakage. The second power supply also had a minor leak, probably caused by the difference in ground level altitude. After equalizing pressure, the leak stopped; operation at altitude for the relatively short periods should cause no trouble.

Recorder optimization tests showed film densities too low, which was attributed to the film processing locally. Further tests will be made to arrive at a suitable procedure. Simple Recorder modifications were made in the ABC attenuator, loop motor gearing, and film speed control circuit to improve operation.

Instability in the Doppler Frequency Tracker is still under investigation. Improper pressure regulation caused replacement of the waveguide nitrogen pressure system; unit 001 was installed with satisfactory operation. Transmitted power output measures 73 watts average or approximately 510 kilowatts peak. Instrumentation control voltages and programmer functions have checked out satisfactorily.

A fit check was made on the radar and instrumentation installed in the vehicle. The fit between the instrumentation and forward part of the radar is snug, but adequate. Two braces were added to the instrumentation recorder rack to snub the CEC recorder laterally.

The antenna was installed at a pitch angle of 4.92 degrees. Installation of the interconnecting waveguide showed one length was

an inch too long. Two waveguides of correct length have been shipped. The flexible section of waveguide may require snubbing to reduce vibration.

The flexible waveguide will be tested for life expectancy. While pressurized internally to 30 psig and heated to 550°F, the waveguide will be flexed a full 6° at the rate of 2 cycles per minute. VSWR and insertion loss will be checked initially and after each 1000 cycles operation.

Corner reflectors are being fabricated at Astro-Electronics Laboratory-a Westinghouse Aerospace facility on the West Coast, with estimated completion by June 15. A reflector alignment tool is being fabricated to aid in the erection of the reflectors. Procurement of spherical reflectors for use in Phase II has been delayed until flight results with the F-101 verify signal strength from some borrowed spheres.

Vehicle flight test personnel indicated the vehicle may be available for radar testing during May. The Antenna and Single Axis Platform will probably remain installed during flight testing of other equipment prior to the radar test.

A procedure has been set up to insure that field personnel get corrected drawings as they become available and change orders to use prior to the correction of drawings.

C ENVIRONMENTAL TEST

Vibration of the transmitter indicated rework necessary in several areas to ruggedize the structure. Transmitter 002 was reworked and retested. The unit is now expected to perform satisfactorily in the environment, although not in the full MIL-T-5422 spec environment. Transmitter 001 will be returned from the field for rework.

Reports on Transmitter vibration and Frequency Generator temperature-altitude will be ready next month.

D RECORDER

Tests of the focus modulation circuit with biased filament were completed. Improvements include a higher Q inductor and reduced temperature coefficient capacitors in the pi-section filter. An investigation showed the remaining drift in output voltage with temperature caused by the forward voltage temperature coefficient of the bridge rectifier diodes to be negligible.

Deflection of the CRT beam on the tube face by magnetic fields has been investigated by Itek. With no shielding on the CRT, the deflection sensitivity is approximately 1 milli-inch per 4 milligauss of tangential magnetic field at the center of the deflection yoke. The present shield of netic-conetic material attenuated a 500 milli-gauss field by a factor of 6.6. Since fields above one or two milli-gauss can produce spot growth or deflection, improvements will be made in the sensitivity of the measuring equipment and the reduction of stray fields to measure lower fields. The field resulting from

the filament transformer measures approximately 8 milligauss at the CRT shield mount point. The field from the inverter transformer measures 70 milligauss. Further investigation is required to determine the best material and configuration for the CRT shield and the advisability of removing magnetic components from the Recorder. Also, the possible intensity modulation caused by stray fields displacing the beam alignment with the apertures will be evaluated.

High voltage power supply #9760 was checked at Itek following repair at Ultronics. The high voltage instability had been repaired, but the power supply would not lock to the 3920 cps synchronizing square wave. The power supply was returned to Ultronics for repair.

Because of the leakage from the power supply in Recorder 005 in the Phase II flight test operation, a second power supply was tested for 10 hours at pressures simulating 5,000 to 45,000 feet altitude. The pressure was cycled and base plate temperature raised to 55°C, but no oil leaks developed. Further testing will be done on the unit which failed.

E ANTENNA

Heat-pressure tests are being continued with I8 fabric bonded over the slots in the same manner as the production array sticks on four slotted waveguides. The sticks are pressurized to 30 psig and heated to 550°F for 20 hours. After removal from the oven and cooling, they are pressure tested under water. The sticks are then put on dry ice unpressurized for one hour, removed and retested with pressure.

F SYSTEM

Temperature tests performed last month on the Frequency Generator indicated improved temperature stability of the DFT reference frequency was required. Temperature compensation of the transistorized dc amplifier has brought the frequency drift within limits. At the same time, the Frequency Generator was reworked to reduce intermodulation and noise on the several outputs. The addition of buffer stages ahead of mixers and the re-routing and filtering of power leads throughout the chassis has reduced the noise output in the video amplifier by a factor of 5:1. Since all the above changes have been proved on the breadboard, the two deliverable Frequency Generators will be modified similarly.

G SPARES

Of 1046 active items on the system spares list, 886 have been delivered to the government, although not all to the Phase II equipment site. Of the open items, 5 are not yet on order, 18 are incomplete Model Shop items, and the remainder are on open purchase orders.

With the Ground Support Equipment spares, 481 of the 590 items have been shipped. Of the open items, 74 are on purchase order and most of the remainder are received but not shipped.